United States Environmental Protection Agency Air and Energy Engineering Research Laboratory Research Triangle Park NC 27711

Research and Development

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Project Summary

Volatile Organic Compound and Particulate Emission Studies of AF Paint Booth Facilities: Phase I

Jacqueline Ayer and Dean Wolbach

Results of volatile organic compound (VOC) and particulate emission studies at three Air Force spray paint facilities are presented. It was found that all three facilities (one at McClellan AFB CA and two at Travis AFB CA) were out of compliance for VOC emissions. The possibility of reducing VOC emissions with recirculation modifications and various control strategies is discussed. Specific recommendations for emission reductions pertaining to each facility are presented.

This Project Summary was developed by EPA's Air and Energy Engineering Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Objective

This study presents the results of volatile organic compound (VOC) and particulate emission surveys performed at three Air Force painting facilities. The three facilities -- one at McClellan AFB Building 655 and two at Travis AFB buildings 550 and 1014 -- did not meet local VOC emission standards. This report discusses the possibility of reducing these emissions with recirculation modifications and various VOC reduction and control strategies.

Although VOC emissions from paint spray booths can be controlled by add-on control systems, control is expensive for present air flow rates. The use of air

recirculation within the spray booth can reduce the cost of VOC emission controls by reducing the quantity of air which requires processing. Recirculation systems were designed for two of the painting facilities included in this study. In designing the systems, various criteria such as paint booth VOC concentrations and health and safety standards were considered. Add-on VOC emission control systems which can be used in conjunction with the recirculation system are evaluated in this study. The devices of interest are a solvent incineration system and an activated carbon adsorption bed. The VOC removal efficiency, initial capital investment, and operating costs for both of these technologies are discussed.

Background

The Air Force uses a number of solvents and solvent-based coatings in many routine operations that are required to maintain aircraft-related equipment. Activities which result in the emission of large quantities of VOCs include metal cleaning, painting, paint removal, fuel storage and transfer, and industrial waste treatment. As a result of these operations, significant quantities of VOCs are released into the atmosphere. For this reason, Air Force operations comprise one of the VOC source categories regulated by the Clean Air Act and state and local laws.

Solvent-based epoxy primers and solvent-based polyurethane topcoats are normally used by the Air Force for painting aircraft. Methylethyl ketone, isopropyl

alcohol, toluene, lacquer thinner, and aliphatic polyurethane thinner are the solvents generally involved in painting. Currently the solvents, primers, coatings for corrosion control, and aerospace topcoats used by the Air Force exceed VOC emission limits established by both federal and state laws. The statutory deadline to comply with both state and federal laws was December 31, 1987.

The study of VOC and particulate emissions and possible reduction strategies at the three Air Force painting facilities took place between June and September 1987. Painting operations at McClellan AFB Building 655 were observed between June 1 and 5. Painting operations at Travis AFB Buildings 550 and 1014 were observed between June 16 and 19, and June 24 and 30, respectively.

Project Description

The project was conducted in two steps. Step 1 involved characterizing the VOC and particulate emissions from the painting facilities included in this study. Step 2 was to make recommendations, based on the data collected in Step 1, of

viable VOC emission reduction and control options for each facility.

Step 1 was accomplished by observing the paint operations occurring at each facility, and sampling for organics and particulates both inside and outside the paint booth. The sampling methods used to characterize the emissions were National Institute of Safety and Health (NIOSH) 500, NIOSH 1300, Modified Method 5, anemometer volume flow, EPA Method 2 volume flow, ST-7, and Method 25A. In addition, records of paint usage rates and paint booth operations were kept. At McClellan AFB, water samples were drawn from the water curtain sumps which remove particulate from the exhaust flow.

Step 2 was accomplished by analyzing the data and developing possible VOC emission control strategies for each painting facility included in this study.

Conclusions and Recommendations

 All three painting facilities included in this study failed to meet applicable VOC emission standards.

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- The adoption of more efficient pa application methods is a viable V emission reduction strategy.
- Paint booth recirculation modification associated with an add-on contributed device would result in significant Vermission reductions.
- A recirculation system could be ins led at the McClellan AFB Building (paint facility at an approximate cost \$47,000. The bleed-off volurequired to maintain the V(concentration below established saf limits is 1,500 scfm (0.71 sm³/sec).
- A recirculation system could be ins led at the Travis AFB Building 10 painting facility at an approximate c of \$33,000. The bleed-off volurequired to maintain the V0 concentration below established saf limits is 860 scfm (0.41 sm³/sec).
- Recommendations specific to easite regarding safe and efficient pabooth operation

Jacqueline Ayer and C. Dean Wolbach are with Acurex Corporation, Mountain View, CA 94039.

Charles H. Darvin is the EPA Project Officer (see below).

The complete report, entitled "Volatile Organic Compound and Particulate Emission Studies of AF Paint Booth Facilities: Phase I," (Order No. ADA 198092; Cost: \$21.95, subject to change) will be available only from:

National Technical Information Service

5285 Port Royal Road Springfield, VA 22161 Telephone: 703-487-4650

The EPA Project Officer can be contacted at:

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